Notes on the AES TESLA Cavity Manufacturing Plan Review. Jan 6, 2006

H Edwards Jan 9, 06
attending: H Carter, M Foley, Timer K, H Padamsee, H Edwards
AES: Rathke, Favale, Petersen, Cole

Edit Jan 23-24, 06 (red) after two discussions with Axel Matheisen.

Summary of decisions and open ends.

Point 13, Do we make both beam pipes short or one long and one short as TESLA?
Make them one long and one short as TESLA. Foley to get the revision drawings and "formal" change to Rathke and Yeoward. Also signed drawings.

Point 5, We need to make sure we are all on same wavelength about the welding and machining with the front side weld only.
John could you give us an estimate for back and front so we knoe what such an increase would be?

Point 2, Bauer must get material and instructions to Rathke for RRR sample test.
Point 4, Nylon ok but no "Plasticizers". Axel still prefers non static poly.
Point 8, Rf measurement device from DESY- I still need to get the info as this seems like the better device.

Further Discussion and notes
Items for further clarification, investigation, or agreed action

1) HOM rf measurement to check notch- Timer will check at appropriate time during end group assembly.

2) RRR of weld sample- sample will be supplied for Bauer to check. Bauer to specify size. (This requirement is part of the DESY spec.)

3) HOM feed through of the JLab type and its flange. I am checking with C Reece.
Reece has responded and knows no reason to suspect a problem with using his feedthrough design and the TESLA flange size. (He points out that he has not thought about it himself and that he has not heard back any test results from DESY. (I think they are not done yet.)
Axel clarified a point on the HOMs that I have been trying to come to gripes with. There are two changes/modifications under consideration.
a) The feedthrough antenna is modified with a larger tip (mushroom) at the end. This is supposed to make the tuning adjustment easier. This involves no change to the cavity or HOM "F" part.
b) There is a design by Jacek and Peter K that has the antenna actually in contact with the 'F" part. This modification needs a slight change to the "F" as well. If this design tests all right Peter would like to use it for the TESLA cavities he is building for us.

I see I have e mail from W-D in Oct05 that says:
-first change was to modify the capacitor between the HOM pick up antenna and the F-part for bigger distance (less sensitivity for adjustment) but keep the capacity. That means to make the surface of the antenna tip bigger ->diameter 12mm. This is realized at the order of 30 cavities at Zanon. No test of this cavities with the HOM coupler pick up is done so far.

-second change we want to use the new JLab feedthrough for the X-FEL. I have two of them and will test them at a cavity (also in CW mode) in the next month.

-third change we are working on is to have a direct connection between the pickup antenna and the F-part without a capacity. Also the pick up port should have no angle to the F-part (in line with the F-part).

*4) The use of Polyethylene or Nylon as bag material. Will ask and talk with Axel yet again.
I discussed this yet again with Axel. He agrees that Nylon should be all-right if that is what AES prefers. Again he stresses that "Plasticizer" must not be used in either material –Polyethylene or Nylon. He prefers the "pink" poly as it has antistatic treatment and does not collect dust.

5) Back welds on end flanges (and other flanges) would be additional cost. I don't think for these cavities we need to consider changing.
This was the major discussion with Axel. I am still going a bit in circles on this.
a) They weld the back sides. (even if the drawings don't say so.) The back side weld is the structural weld like 2-4 mm. The vac side weld is a cosmetic and vac tight weld of ~0.3mm which does not affect the end surface of the pipe being welded. The pipe sticks out from the flange like .5mm (to 1mm) and this weld is made around the outside of the pipe.
b) The weld surface is not machined FLAT afterward. It is important to have the pipe end sticking out that little bit as it makes the sealing for chemistry much easier. Apparently they found it very difficult to get a seal if the flange area was machined flat.
c) He agrees that for the new Saclay tuner design pushes on the end flange and for this design it may be necessary to have a strong structural weld on the back side.

On talking with Axel again, he says the back welding is new and Reschke has drawings for one cell. Reschke has asked Iversen to send me drawings, which I now have. However Iversen says this is only for internal desy r&d weld program and not for further outside procurement.

What should we do?
a) The FNAL drawings do not very well specify the problem. E.g. D 4904.010-MD-43180 should make it more clear that the weld is 3mm deep and that the finished flange surface should have the beam pipe sticking out from the vac sealing surface by 0.5mm (The same height as the outer surface of the flange.) after machining . The pipe end

should be smooth enough to make an acid seal. I stress this because I heard Tony say they machine everything FLAT. We do not want that.
John's transp 40 and 48. discuss this. Transp 40 lower right does show the pipe sticking out. (It looks like this drawing may come from Cornell.)

b) Have AES tell us what the additional cost would be to do the back side welds. John can you do this with out too much work? I believe we will go with a) but it would be nice to know the differential cost.

6) Helium vessel ends – what is the material, and how formed? The inner diameter end rings are forged RRR300. The outer diameter cones are NbTi (flat and must be formed)

*7) Stiffening rings and end vessel rings RRR 300? or reactor? The stiffening rings on the dumbbells are reactor grade. In the future should this be changed to RRR? See above for end vessel rings. The end vessel inner ring stiffener welding is very tricky. Should there be any sort of shield put in between the inner to outer ring weld and the end cell?
a) The stiffening rings are reactor grade and do not seem to be a problem, but would be small expense if RRR.
b) The end ref rings are RRR. There was worry about them being close to the rf surface especially during welding assembly (I think).
c) The conical part is NbTi. This was changed from 3 to 5mm to make it stronger. Our drawings show 5mm. (Our material is like ~5.5 mm anyway.) In the future, further strengthening should be considered.
d) Presently there is a Ti adapter ring between the outer diameter of the cone and the Ti Helium vessel. The adapter is e beam welded to the cone. A protective shield is used in case of punch through. Then a Ti to Ti tig weld is made to the helium vessel.
e) The helium vessel is of course different if a blade tuner is used instead of a Saclay type.
Axel says that the conical part drawing should show NbTi and 5mm. (The older drawing is Nb and 3mm).

*8) Half cell and dumbbell measurement device. We will try to get from Krebs the drawings. Also Timer to build at least one.
He says to ask Krebs and Proch about getting drawings. I still have to do this.
He also says that they started with the weight design concept and found it did not work nearly as well or reproducibly as their present design which can put more uniform contact pressure around the edge of the equator.

9) 2 of each type half cells (tot 6) used for weld samples to be sent Timer to check freq.

*10) Better design of transport system for parts prepared for welding to be considered. Ed discussed a modification that would get away from screw that looked like a very bad idea.
Axel feels the transport caps are ok if the screw that goes into the internal spacer is changed to a shaft, so that the connection of a nut is made on the outside. Ed had an idea that sounded like it might be even better with the connection all on the out side.

11) Parts to be available at AES for rf measurement by Timer. But he must be there at the appropriate time so as to not interfer with the schedule.

12) Foley to participate at e beaming at Ebtec.

13) Discussion on the short“long” beam pipe length. I am sure there will be more discussion.
With respect to using cavities with short beam pipes on both ends for either a type 3 or a new module with shorter spacing the only issue Axel could think of was associated with the gatevalve on the module end. Here the procedure for mounting of the gatevalve would need to be worked out so as to avoid particle contamination. Presently bolts are mounted from the cavity flange side. With a shorter pipe this would no longer be possible at least in some bolt locations. The obvious solution is to use studs that are first mounted in the gate valve. Care, back venting, and some temporary beam pipe shield would need to be worked out so as to keep particles out of the pipe while the valve with studs is mounted to the cavity flange.

Also From Axel on the issue of beam pipes and modifying them-
We modify the beam pipes in different ways.
1) For the renewed flange system on module 2 cavities we only removed the Niobium lips and made a top on weld to connect the Nb Ti flange to the beam pipe. That's one chance to reduce length.
2) The second we did on cavities from module 1 was to cut of a part of the beam pipe and made a circular weld to connect beam pipe tube to bema pipe tube with the new flanges on.
3) We had beam pipes with leaks on HOM coupler or Pick up weld. Here the whole beam pipe was cut away and a new one was welded on at the connection of the cone (reference ring) to the beam pipe. This was very tricky because this weld had to be done in two steps. Accel did this for us and it was successfully.
From my point of view you have a chance to modify the beam pipe after wards with a small risk only. So any decision on start with a short pipe or long pipe version can be corrected afterwards
Axel

The big question – to be long or short?
The unwavering decision yesterday (Jan 23) was to go back to a “pure TESLA design with one long and one short pipe. Foley will get drawings and revisions to Rathke and Mike Yeoward.